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Red Radiolarite Availability in Western Liguria?

A Challenging Enigma from Ortovero (Savona, Liguria, Northern Italy)

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Résumé : Les auteurs présentent la récente découverte d'un nouveau site préhistorique à Ortovero, près d'Albenga (province de Savone, Italie) en Ligurie occidentale qui peut être datée sur la base d'observations typologiques à la fin de l'Épigravettien ou au Sauveterrien. La matière première de l'ensemble lithique ressemble à celles des affleurements de radiolarite rouge de Ligurie orientale, bien que le nombre élevé de pièces réalisées sur ce matériau et la distance aux sources supposées nous amène à considérer cette hypothèse avec prudence. À la lumière des prospections de terrain conduites durant ces dernières années, les auteurs signalent l'existence d'un affleurement inconnu de radiolarites vitreuses rouges dans les environs du site, correspondant à la formation des « radiolarites d'Arnasco » qui affleurent non loin d'Ortovero.

Mots-clés : Paléolithique, Mésolithique, affleurements, matières premières, approvisionnement, Ligurie, Italie.

Abstract: The authors present a new prehistoric site recently discovered at Ortovero, near Albenga (Savona Province, Italy) in Western Liguria that can be attributed on typological grounds to the Final Epigravettian or to the Sauveterrian. The raw-material characteristics of the chipped stone artefacts resemble those stemming from the red radiolarite outcrops of Eastern Liguria, although the large number of pieces manufactured from this material and the distance from the supposed sources challenge this hypothesis. As a result of field surveys carried out over the last few years, the authors discuss the possibility of a formerly unknown source of vitreous red-coloured radiolarite outcropping in the surroundings of the site that may correspond to the Arnasco radiolarite formation outcropping near Ortovero

Keywords: Palaeolithic, Mesolithic, outcrops, raw materials, procurement, Liguria, Italy.

Red radiolarite, also named 'red jasper' (diaspro rosso in Italian) in the local archaeological literature, is very common in the Ligurian-Tuscan-Emilian Apennines (fig. 1). In this area the largest formation is the Roccagrande-Lama-Prà rbera outcrop (Parma), which includes layers of high-quality flints. The outcrop is also characterised by the presence of numerous workshops dated from the Middle Palaeolithic to the Copper Age (Ghiretti et al., 2002; Negrino et al., in press a and b). Another noteworthy site is the prehistoric Valle Lagorara quarry (Eastern Liguria), dated to the Copper Age, which exploited an impressive red radiolarite outcrop (Campana and Maggi, 2002).

This raw material is quite common in the Eastern Ligurian Apennines, even in localised good-quality outcrops (Campana et al., 2013), whereas—despite the presence of a radiolarite-bearing geological formation (Arnasco radiolarites)—, suitable raw material for knapping, as discussed below, has not so far been recovered from the western part of the region.

The Arnasco radiolarites (Dallagiovanna and Di Giulio, 1984; Dallagiovanna and Seno, 1984) belong to the Arnasco-Castelbianco unit, outcropping in the hinterland of Albenga (fig. 2). This unit was deposited on the thinned and faulted European margin (Piemont domain; Vanossi, 1991). The sedimentary succession of the Arnasco-Castelbianco unit (Upper Triassic-Eocene) is as follows: Monte Atena dolostone (Norian), Veravo limestone (Rhetian), Rocca Livernà limestone (Lias), Monte Galero breccia (Lias-Dogger), Arnasco radiolarites (Malm), Menosio limestone (Neocomian), Albenga formation (Cretaceous?-Middle Eocene). These lithostratigraphic

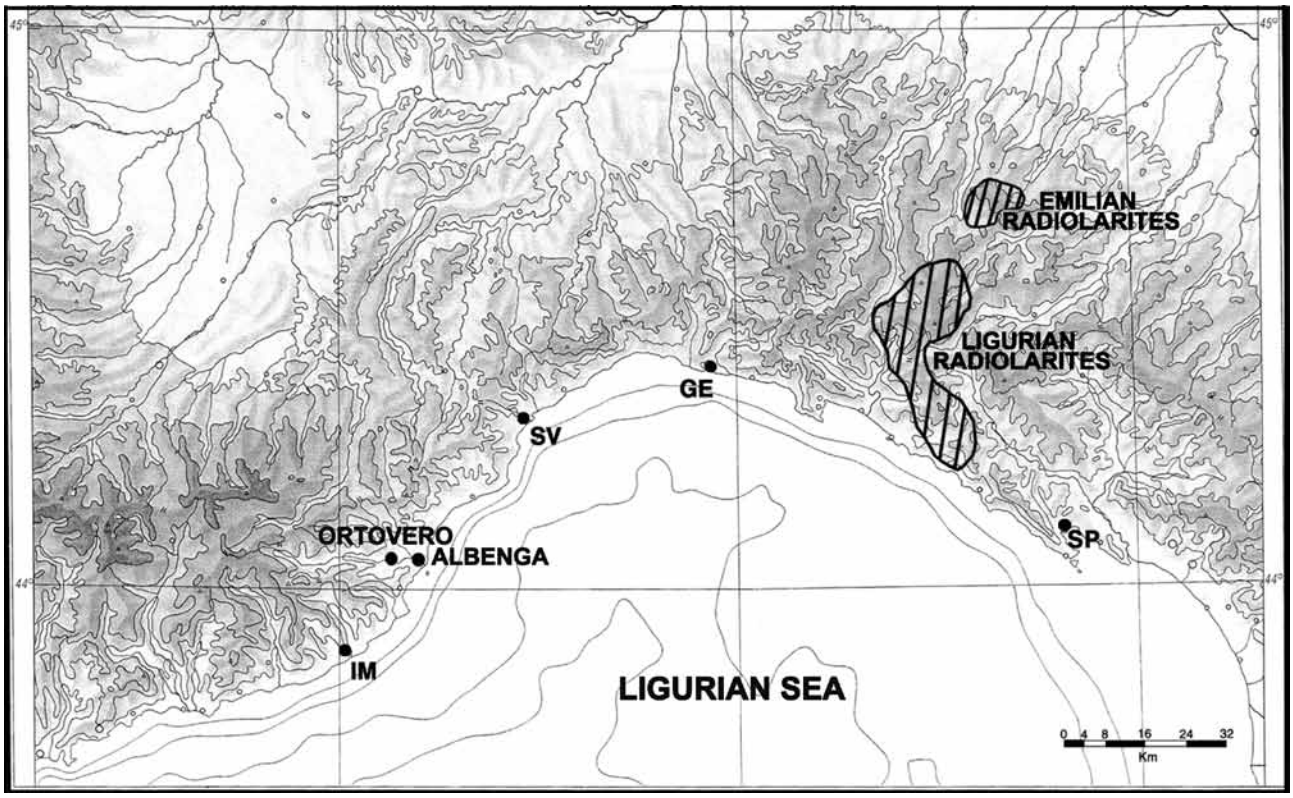


Fig. 1 – Map of Liguria with the localities mentioned in the text and the location of the red radiolarite outcrops of eastern Ligurian and the Emilian Apennine.
Fig. 1 – Carte de la Ligurie avec l'indication des localités mentionnées dans le texte et la localisation des affleurements de radiolarite rouge dans les Apennins de Ligurie orientale et d'Émilie.

units record a gradual drowning of the continental margin consequent to the opening of the Piemont- Liguria ocean. The Arnasco radiolarites and the overlying Menosio limestone were deposited in a very deep oceanic environment during the maximum deepening of the basin.

The Arnasco radiolarites are composed mainly of thin-bedded red, green or grey cherts, radiolarian cherts, radiolarites, claystones and siliceous schists. According to G. Dallagiovanna and A. Di Giulio (Dallagiovanna and Di Giulio, 1984), the formation can be subdivided into three distinct levels, from bottom to top:

1) marly claystones, alternating with thin-bedded sandstones and fine conglomerates;

2) thin-bedded greyish-black and light grey fine-grained to subvitreous cherts alternating with dark to light grey siliceous claystones;

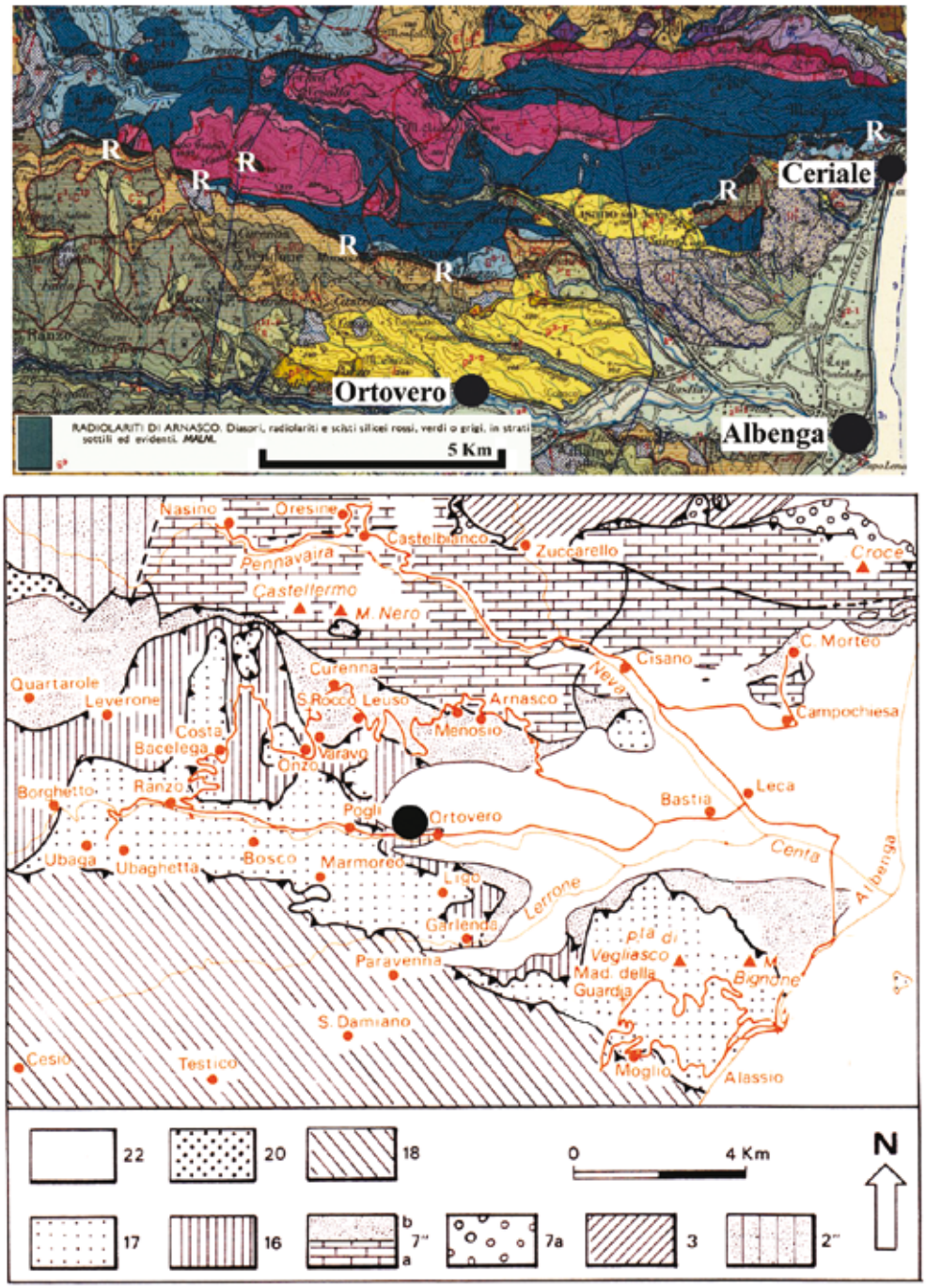
3) a-few-centimetres-thick rhythmic alternation of greenish to reddish siliceous claystones with reddish cherts/radiolarian cherts, in which are intercalated thick beds of conglomerates or thin clay layers alternating with sandstones and fine conglomerates. The top of this level is characterised locally (Case Morteo) by a thick deposit of alternating radiolarites and pelites, unevenly interbedded with thin claystone beds.

The Arnasco radiolarites discontinuously outcrop in a small area between Cima Autero and Monte Cucco, on the right bank of the Pennavaire river and along the provincial road connecting the Aquila d'Arroscia and Leverone villages. Another well-described outcrop (Dallagiovanna et al., 1991) is located near Albenga (Case Morteo) and Ceriale. Their average thickness is 25 m but they can reach 70 m.

The Arnasco radiolarites gradually merge into the Menosio limestone, which is represented by well-bedded whitish micritic limestone containing lenses and nodules of light grey cherts (Maiolica/Calpionella limestone facies) reaching a thickness of about 15 m (Dallagiovanna and Di Giulio, 1984).

Palaeolithic and Mesolithic artefacts and workshops, and also later traces of mining activity, were discovered in Eastern Liguria, Western Emilia and North-Western Tuscany. They are proof that radiolarites were widely exploited from the Middle Palaeolithic up to the Early Bronze Age (Campana and Maggi, 2002; Ghiretti et al. 2002; Negrino et al., in press a and b).

In Liguria Epigravettian and Mesolithic evidence is testified to by a few sites. Epigravettian evidence is well-known from several caves in Western Liguria (Balzi Rossi, Imperia; Val Pennavaire and Arene Candide, Savona), as well as from open-air sites scattered in the Apennines and their valleys (Baffico et al., 1983; Biagi and Maggi, 1984; Binder and Maggi, 2001; Negrino and Tozzi, 2008; Tomasso et al., 2014). Mesolithic sites are rarer and those reported so far are almost exclusively concentrated in the Eastern Ligurian Apennines (Biagi



Schema tettonico.

***2"**, **3**= U. brianzonesi risp. di Caprauna-Armetta e di Castelvecchio-Cerisola. **7a**= U. prepiemontese di C. Tuberto, serie permo-mesozoica pre-radiolariti. **7"**= U. prepiemontese di Arnasco-Castelbianco (**a**: elemento di Castelbianco, terreni pre-radiolariti; **b**: elemento di Arnasco, dalle radiolariti alla F. di Albenga). **16**= U. di Colla Domenica-Leverone. **17**= U. di Borghetto. **18**= U. di Moglio-Testico. **20**= Complesso di base dei Flysch a Elmintoidi e/o olistostromi al tetto delle successioni brianzonesi esterne, eventualmente associati al "Flysch nero". **22**= Depositi marini e continentali plio-quaternari.*

Fig. 2 – Top: geological map excerpt with the distribution of the 'Arnasco radiolarites' formation (R) in the surroundings of Ortovero (Carta Geologica d'Italia, Foglio 92-93 Albenga-Savona modified); bottom: geological units of the area under study with the distribution of the radiolarites (unit 7"b); the black spot indicates the location of the prehistoric site (modified from Dallagiovanna et al., 1991, fig. 10.1).

Fig. 2 – En haut : extrait de la carte géologique montrant la localisation des « radiolarites d'Arnasco », dans les alentours d'Ortovero (carte géologique d'Italie, feuille 92-93, Albenga-Savona modifiée). En bas : unités géologiques de l'aire d'étude et distribution des radiolarites (unité 7"b), le point noir indique la localisation du site préhistorique (modifié d'après Dallagiovanna et al., 1991, fig. 10.1).

and Maggi, 1984; Binder and Maggi, 2001; Maggi and Negrino, 1992). In Western Liguria the evidence is very limited: the Ortovero site, along with Punta della Mortola (Baroni and Biagi, 1990), near Ventimiglia (Imperia), Pian del Re (Massimo Ricci, pers. comm.), near Sanremo (Imperia), and Colla di San Giacomo (Franco, 2011, p. 274; Arobba and Vicino 2013, p. 87), near Finale Ligure (Savona), is the fourth potential settlement that can be assigned to this cultural phase.

The absence of clear evidence for Mesolithic settlement in Western Liguria has been the subject, in the past, of a discussion about the Early Holocene settlement of this region. Some scholars maintained the idea that an Epigravettian tradition had survived in the deep valleys of Western Liguria up to the Early Holocene, and should therefore be contemporary with the development of the Mesolithic cultures in the remainder of the Italian peninsula (see discussion in Palma di Cesnola, 1993, p. 289-292). This hypothesis was advanced on the basis of the conventional radiocarbon dates obtained in the last century for the Epigravettian layers of two caves in the Val Pennavaire (Arma di Nasino and Arma dello Stefanin – Imperia: Alessio et al., 1967; Leale Anfossi, 1972; Palma di Cesnola, 1974). Given that Mesolithic evidence was widespread both in adjacent Provence and in Northern Italy (Biagi, 1991; Brochier, 1982; Tomasso et al., 2014; Walsh et al., 2007) and given the problematic character of the dated sequences of the aforementioned Ligurian caves, this theory is no longer reliable. As a matter of fact, recent excavations at Arma dello Stefanin (Biagi et al., 1987; Barker et al., 1990) demonstrated that the Early Neolithic fireplaces, one of which was dated to 6610 ± 60 BP (Bln-3276), immediately overlaid the Final Palaeolithic occupations, re-dated more convincingly to 12700 ± 300 BP (HAR-6915). These latter may have caused charcoal merging as revealed by the very late radiocarbon dates of the Epigravettian occupation. Moreover, subsequent refitting of the Upper Palaeolithic lithic assemblage carried out by one of the authors (F. N.) demonstrated that several pieces stemming from different depths refit, thus revealing vertical movement of the artefacts within the deposit. In this context the presence of a single obsidian scraper with marginal retouch in the Palaeolithic layer V can be explained as an intrusion from the overlying Early Neolithic layer III (Leale Anfossi, 1972, p. 259) [(1)].

Finally, the absence of Mesolithic remains can be reasonably explained not only by a different settlement strategy, but also by the incomplete knowledge of the archaeological sites in this area, because of the lack of systematic surveys.

The lithic assemblages of the Epigravettian sites are characterised by a wide range of mainly local but also imported lithic raw materials [2].

In Western Liguria imported artefacts in Late Pleistocene sites are made from siliceous rocks originating from sources in France and the Italian Apennines, but also from radiolarite outcrops in Liguria, Tuscany and Emilia as well as from the Scaglia formation in the Marche region, reflecting a well-organised exchange network extending over more than 400 km (Negrino and Starnini, 2003, 2006 and 2010; Tomasso et al., 2014). During the Mesolithic radiolarites are present in Western Liguria in the Colla di San Giacomo site, although they are very rare and occur with artefacts manufactured from different types of siliceous rocks (Franco, 2011; Arobba and Vicino, 2013). By contrast the Mesolithic assemblages discovered in Eastern Liguria were produced almost exclusively from local red radiolarites and greyish-whitish siliceous nodules stemming from the local Calpionella limestone formation (Maggi and Negrino, 1992; Negrino and Starnini, 2003; 2006 and 2010).

Moreover, rare red and green radiolarite artefacts, supposedly of Eastern Ligurian provenance, have been identified among the Neolithic chipped stone assemblages recovered from cave sites in Western Liguria, such as Arene Candide and Pollera (Negrino and Starnini, 2003; 2006 and 2010). Finally, radiolarite quarries are known in Eastern Liguria, dated between the beginning of the Copper Age and the Early Bronze Age (Campana and Maggi, 2002), and in the above-mentioned Roccagrande-Lama-Pràrbera outcrop (Negrino et al., in press a and b).

This scenario, regarded as valid until recently, was challenged by the discovery of a new prehistoric site at Ortovero (Ceccon et al., 2010) in the interior of the Albenga plain in Western Liguria (fig. 2).

THE PREHISTORIC SITE OF ORTOVERO

The Ortovero site was discovered by chance on the occasion of the construction of a private house in the Ortovero village and reported to the Soprintendenza per i Beni Archeologici della Liguria in 2004 (Del Lucchese, 2008; Ceccon et al., 2010). It is located on a Pleistocene river terrace along the Arroscia torrent (fig. 1 and fig. 2). Unfortunately the discoverers (M. Ceccon and G.Vicino) collected the lithic assemblage, which consisted of 205 pieces entirely in a secondary position, from the dumped soil stemming from the excavation of the subterranean garage of the building. It is possible that an undisturbed part of the deposit is preserved in the adjacent parcels, but at present there are neither the financial nor the logistic resources to organise an archaeological excavation.

The lithic artefacts are comprised mainly of debitage products except for one bladelet and one small bladelet/flakelet core (fig. 3, nos. 1, 2, 4 and 7). Although diagnostic elements are rare (a few fragments of backed tools and geometrics; fig. 3, nos. 5 and 6), the debitage modules and distinct typological-technological characteristics of the assemblage are very similar to those of the Ferrada di Moconesi site in Eastern Liguria (Maggi and Nebiacolombo, 1987). The lithic assemblage can therefore be tentatively attributed to a very late Epigravettian or to the Sauveterrian (Ceccon et al., 2010). The location of the site,

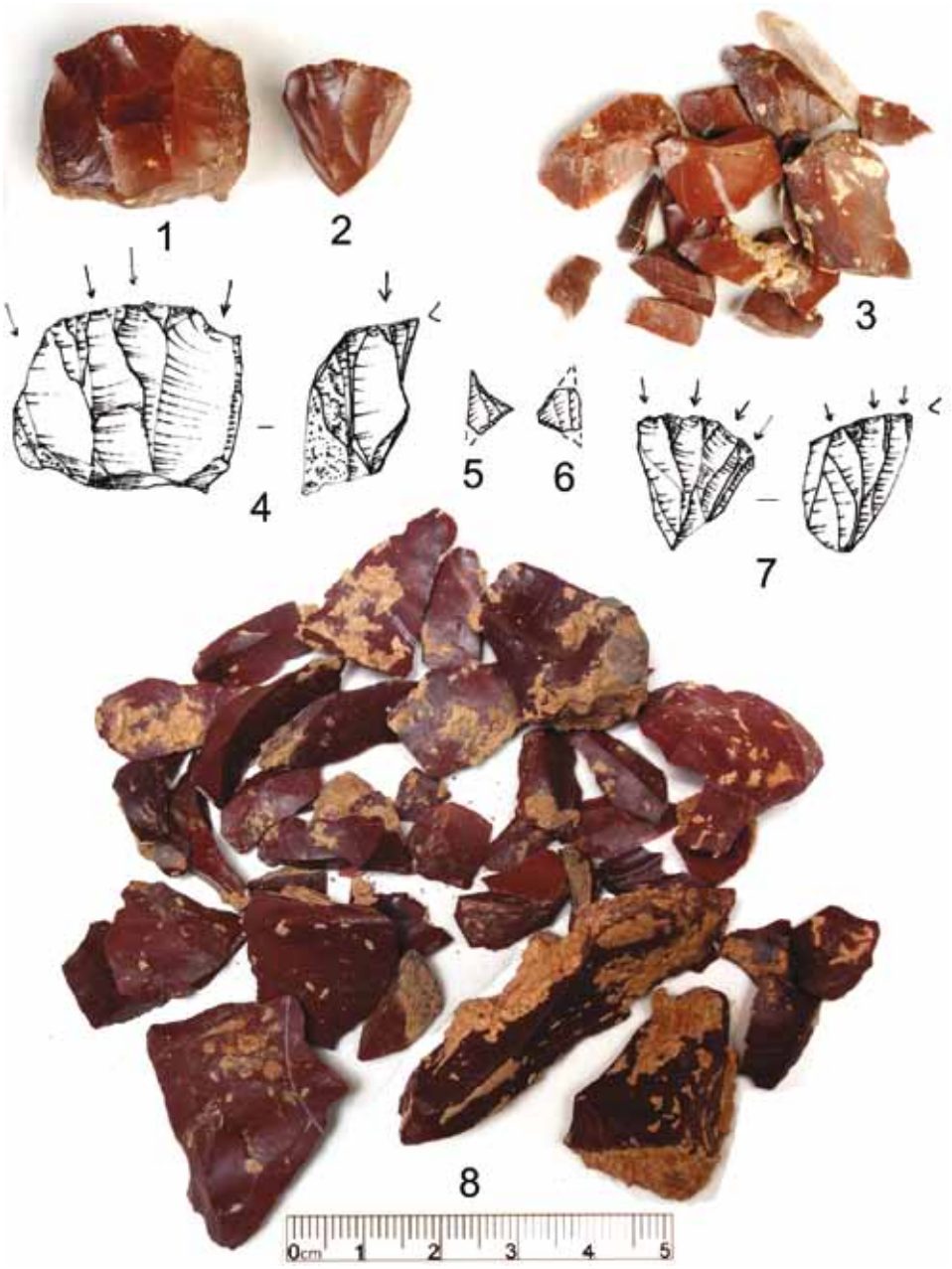


Fig. 3 – Artefacts from the Ortovero findspot. 1-2, 4, and 7: photographs and drawings of two red radiolarite microbladelets cores; 3: unretouched artefacts stemming from laminar debitage; 5 and 6: fragments of possible geometric microliths of triangular shape; 8: red radiolarite flakes.

Fig. 3 – Matériel lithique de la station d'Ortovero. 1-2, 4 et 7 : photographies et dessins de deux nucleus à microlamelles ; 3 : produits laminaires non retouchés ; 5 et 6 : fragments possibles d'armatures géométriques triangulaires ; 8 : éclats en radiolarite rouge.

on a Pleistocene terrace in the Arroscia valley bottom, also closely resembles the situation of the Ferrada di Moconesi site.

The challenging characteristic of this industry is indeed the raw material. Except for some greyish-white and pinkish-white flint pieces it is similar to the raw materials of the Eastern Apennine sources, including the Val Baganza flint (PR) and, surprisingly, it is to a great extent represented by liver-red radiolarite (fig. 3, nos. 3 and 8) closely resembling that outcropping in Eastern Liguria (fig. 1), while other lithotypes occur in small numbers, for example a single dark-brown flint, probably stemming from the Provence outcrops in France. According to the evidence of raw-material exploitation models recently developed for the sites in Liguria (Negrino and Starnini, 2003; 2006 and 2010), we would expect and predict a preferential use of circum-local lithotypes for sites dated to these periods. On the other hand, the characteristics of the lithic assemblage seem to exclude other chronological/cultural attributions.

The macroscopic characteristics of the raw materials displayed by the assemblage are identical to those of the Eastern Ligurian radiolarite outcrops that are located at least 100 km as the crow flies away from Ortovero. Thus

this assemblage represents an enigma as regards the raw material and two questions arise: is it almost completely manufactured from imported material? Or can we deduce the presence of an unknown radiolarite outcrop in its surroundings? To explain this enigmatic pattern, two hypotheses can be advanced:

1) If the first hypothesis is admitted, this site resembles and must be interpreted as being the camp of a human group originating from Eastern Liguria largely using the characteristic raw materials (red radiolarites) of that area. This pattern could be explained by the lack of suitable siliceous rocks in the Albenga area. The presence within the assemblage of a single piece made from Val Baganza flint would support this hypothesis. The Ortovero site would then represent a unique case with regard to the current knowledge about raw-material use in this region. However, as mentioned above, Late Epigravettian/Mesolithic sites are very scarcely known and not numerous enough to build a reliable 'model'.

2) If the second hypothesis is admitted, it would perfectly fit the model of a prevailing use of local raw materials reconstructed for the considered period of time, which predicts the use of circum-local lithotypes and the exploitation of imported raw material only for those sites located far away from suitable outcrops (Grimaldi, 2005; Peresani, 1994; Starnini, 1997).

RED RADIOLARITE AVAILABILITY IN WESTERN LIGURIA?

The 'Albenga' sheet of the Italian geological map (Carta Geologica d'Italia, Foglio Albenga no. 92-93, 1:100.000 IGM) shows the presence of a formation called 'Arnasco radiolarites' (Boni et al., 1971, p. 66).

In order to verify the information and to collect samples to test the raw-material quality, short surveys were carried out during summer 2012-2013 and winter 2014 along the mountain ridge between Bezzo-Arnasco and Curenna-Monte Nero and in the nearby streambeds. Although the slope morphologies are strongly modified by centuries-long agricultural activity, i.e. dry stone terrace-building for olive culture, it was noticed that red radiolarite deposits, although altered, outcrop and can be followed over several kilometres (fig. 4). However, although the explored outcrops did not present suitable siliceous layers that could be exploited for the manufacture of artefacts, the survey can only be considered as complete when the other occurrences in the Arroscia and Pennavaire valleys and between Salea and Ceriale mapped on the geological sheet and mentioned in the geological literature have been surveyed. The question therefore remains unresolved.

Fig. 4 – Aspect of the radiolarite outcrops surveyed in 2013 between Bezzo, Arnasco and Monte Nero.
Fig. 4 – Affleurements de radiolarite prospectés en 2013 entre Bezzo, Arnasco et Monte Nero.

We hope in the future to have the necessary resources to be able to complete the exploration of the area, including all the small valleys and secondary alluvial deposits. Currently the absence of suitable raw material on the surface or in outcrops in the surveyed area does not enable us to exclude either the complete erosion of the deposit or its obliteration under the recent alluvial cover, or its not yet localised, very limited extension.

DISCUSSION AND CONCLUSIONS

The raw materials of the chipped stone assemblages from the Upper Palaeolithic sequence of Arma dello Stefanin are comprised of a variety of 'western' lithotypes reflecting the complex and wide mobility range of the human groups at the end of the Pleistocene. The absence of Mesolithic sites in the Savona area, with the exception of the Colla di San Giacomo site (actually a small assemblage composed of a few artefacts), does not enable us to fully understand the raw-material circulation patterns in this area during that period. In Eastern Liguria Mesolithic assemblages seem to reflect a more limited mobility range, but Eastern Liguria is an area where outcrops of good-quality siliceous raw materials are rather substantial.

If the local availability of vitreous red radiolarite layers is confirmed in the future, Ortovero should be regarded as a Late Epigravettian or at least a Preboreal/ Sauveterrian open-air site, in which the local red radiolarite was the main raw-material source exploited for the chipped stone industry. Thus, the implications of such a hypothetical discovery would affect and challenge our present knowledge about the models of red radiolarite circulation in Western Liguria and Provence, opening up new scenarios on prehistoric human behaviours: ranging from the provenance of the very rare red radiolarite tools from the Mousterian layers of the Balzi Rossi caves (Liguria) and Pié Lombard shelter (Provence: Porraz and Negrino, 2008) to that of the Neolithic artefacts at Arene Candide (Starnini 1999), the source of which should possibly be searched for closer and into a westerly direction, rather than in Eastern Liguria.

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NOTES

(1) It is necessary to mention that the supposed presence of obsidian artefacts in Ligurian Epipalaeolithic contexts (Martini, 1993, p. 260) has not so far received any undisputed confirmation. The obsidian scraper from Arma dello Stefanin (Leale Anfossi, 1972) is indeed attributable to the Early Neolithic layers of the cave. In addition, the presence of a single obsidian end-scraper from layer A of Riparo Mochi, cited by Laplace (1977, p. 9), was never confirmed and no further pieces of this raw material were ever found in subsequent excavations or on the occasion of recent re-examinations of the artefacts from the Balzi Rossi caves. It is possible that this scraper was actually manufactured from a very dark-blackish flint variety, known in south-eastern France, that, at that time, was not identified (see Porraz et al., 2010).

(2) We consider the raw materials as local or imported on the basis of the parameters set by D. Binder (Binder, 1998) considering the distances between potential sources and sites of use.

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